REMARKS

Claims 1-34 are pending in this case. Claims 1-23 were rejected by the Examiner and claims 24-34 provisionally were withdrawn according to a telephonic communication with the Examiner. In this response, applicant amends independent claims 1, 7, and 11, and provides arguments why the claims are not obviated by references cited by the Examiner. Applicant also cancels claims 24-34 without prejudice and expressly reserves the right to reassert these claims in another application. New claims 35-39 are presented that emphasize discussed aspects of the claimed invention.

The terms "wherein the sludge reaches a maximum temperature of 50 degrees centigrade in response to the ultrasonic energy" and "wherein the wet sludge remains at a maximum temperature of 50 degrees centigrade at all times" that have been added to the claims are supported throughout the specification, for example, on page 11, lines 12-23, and page 16 lines 4-7 and 16-18. The terms presented in new claims 35 to 38 are supported, for example, by the recitations of cancelled claims 31-34. Accordingly, no new matter or unsearched matter has been added to the new claims.

The Restriction Requirement

Claims 24-34 are cancelled in the present response, leaving claims 1-23 that the Examiner has classed together, for further examination. New claims 35-38 incorporate added elements into one or more of claims 1-23 and are not a new group.

Objection to the Specification

On the bottom of page 2, the Examiner has objected to a typo on page 22, wherein the first sentence after a heading on line 14 is attached to that heading. A replacement paragraph has been provided. Reconsideration is requested.

103 (a) Rejection over Toth combined with Kantardijeff

On page 3 of the office action, an obviousness rejection is asserted over Toth combined with Kantardijieff, based on a belief that "Toth et al. disclose .... a process for removing volatile gas from wet sludge and concentration of watery sludge substantially as claimed." However, these references, even in combination do not describe the low temperature, low total sonication power input per mass of treated sludge, combined with oxidant, and selective microbial killing obtained in the claimed invention.

Toth and Kantardijieff employ high temperatures and/or lack selective microbe killing.

Toth fundamentally differs. Toth teaches "sonic treatment of a few minutes" (see abstract for ex), which is much harsher than conditions used in the present invention. In fact, "[a]s a consequence of the [sonic] treatment, the sludge will warm up to about 70 deg. C." (column 3 lines 2-3). The sonication procedure, its functioning, and its effect on the sludge all differ substantially. Toth uses extensive sonication to kill microbes. This extensive sonication provides extensive heating which (Toth admits on

column 3 lines 3-4 "increases the disinfecting effect" yet is unacceptable for the claimed invention.

Kantardjieff fundamentally differs. Kantardjief coats a solid fraction and NOT a liquid fraction with zeolite. See column 3 lines 62-66 "The latter [solid or semi-solid] can be treated separately .....for coating substances with high ammonia content. The ammonia is fixed by the zeolite in a mixing and coating process and the resulting coated waste....." In fact, the coating layer itself "blocks the ammonia-nitrogen" (column 4 line 55) as a layer between ammonia inside particles and the surrounding air. Otherwise, Kantardjieff states that zeolite "has previously been used as an ion exchange media" (column 4 lines 1-2) but does not teach the value of lightly sonicating a sludge to faciliate transfer of ammonium ion to zeolite. In fact, the particular use of zeolite is not as a regular ion exchange membrane, but appears to involve binding of non-charged ammonia gas specifically. The combination of lightly sonicating with zeolite is not taught. In fact, Kantardjieff teach instead the use of coating a solid or semi-solid with dry material. This is an incompatible alternative use and the statement of using zeolite as an ion exchange material does not suggest or describe a process of facilitating binding of a non-charged ammonia to zeolite, or the use of brief ultrasonics to increase transfer of uncharged gas molecules out of the sludge.

In this context, applicant points out that brief and high power ultrasonics, in a particularly desirable embodiment was needed to allow a high flow rate process at the higher pressures needed to achieve a flow velocity associated with a continuous flow system. In contrast, the cited art, as is well known, emphasizes reliance on a high

power consumption - high total sonication power per unit time per unit mass sludge, which causes a higher temperature. In fact, the prior art techniques of a) low pressure sonication conditions, b) lower instantaneous sonication power for much longer time periods, and c) much higher energy input per unit mass treated, leads away from the successful combination used and claimed for the invention.

The Claimed Invention Uses a low Temperature Process that Discriminates Between Fecal Microbes and Soil Microbes

In contrast to the cited art, applicant surprisingly discovered that preferential killing of undesirable (facultative/anaerobic) microbes over desirable aerobic soil bacterial could be obtained at much lower energy cost by a low temperature process. The filed claims in part emphasized this feature (limiting energy input in claims 4, 8, 11, 28, and maximum temperature in claim 16). See data near the bottom of Figure 3 ("Heterotrophic Plate Count" and "Fecal Coliform") and Figure 4 ("Heterotrophic Plate Count" and "Fecal Coliform"), which show the differential effects of sonication and of the overall process, respectively, on soil organisms vs fecal organisms.

The claims have been amended to emphasize the low temperature used. Claims 1-10 now include: "wherein the sludge reaches a maximum temperature of 50 degrees centigrade in response to the ultrasonic energy" and claims 11 to 23 recite " wherein the wet sludge remains at a maximum temperature of 50 degrees centigrade at all times."

Without wishing to be bound by any one theory for why differential killing occurs in the process, it is believed that adding an oxidant, particularly to material that has been sonicated to break into individual microbes to allow oxidative access, selectively kills anaerobes/facultative anaerobes over regular soil bacteria. Keeping the temperature low (such as by minimizing sonication so that it does not use enough energy to disinfect) is important to this embodiment. Also desirable is the prolonged contact time with oxidant in the absence of sonication because sonication bubbles remove oxidant and desirably are minimized in this embodiment, as described for example in the specification from the bottom of page 24 through the middle of page 25. Claims 35 through 39 have been added to emphasize this feature.

Because the amended claims and new claims 35-39 contain elements that are not found in the cited art, reconsideration and allowance respectfully are requested.

Unexpected Results Obtained from Combining a Low Temperature Process with Low Heating Sonication and Oxidation

An important desire in many instances of remediation is to selectively kill coliform bacteria while minimizing damage to regular soil aerobic bacteria. As explained above, applicant was surprised to find a combination (now expressly recited in the amended claims) that achieves this. The unexpected results (data near the bottom of Figure 3 "Heterotrophic Plate Count" and "Fecal Coliform" and in Figure 4 "Heterotrophic Plate Count" and "Fecal Coliform"), arise from maintaining a low temperature while briefly sonicating to suspend microorganisms, without imparting enough energy to heat, and also adding oxidant after sonication and not before. The amount of sonication energy needed to substantially kill microorganisms unavoidably creates a high temperature, which generally in this art, is highly desirable, as referred to by Toth at the beginning of column 3. In fact, use of lower total electrical energy for sonication just to suspend, as part of a killing process is against the grain of thought in this field. In fact, the entire preferred process in the claimed invention, prior to the heating step, requires a low temperature to achieve the unexpected result.

While requiring some sonication to break apart individual microbes, it was also found surprisingly that oxidant added after sonication improved these results. Thus, the combination of a limited sonication, addition of oxidant to contact with sonicated material, and maintaining low temperature is highly desirable. Furthermore, it was found that maintaining the low temperature during drying further improved the selectivity

of killing coliforms with respect to desirable aerobic bacteria. Without wishing to be bound by any one theory of this embodiment, it is believed that the killed coliforms provided nutrients to the aerobes, which grew and multiplied during the low temperature drying step. Figure 3 (bottom) shows that "Heterotrophic Plate Count" actually increased during low temperature drying, consistent with this idea.

Because none of the references even when taken together describe this claimed combination, reconsideration and allowance is requested. Applicant further requests reconsideration and allowance based on the unexpected results, which separately indicate that the combination is unobvious.

Rejection of claims 19, 20, and 22 on further obviousness grounds

As described above, the claims as amended recite low temperature processes that do not utilize high or prolonged levels of sonication that heat sludge enough for temperature based killing. The Edwards, Cizek and Argull references cited on page 4 of the office action also lack these elements. Accordingly, claims 19, 20 and 22 are unobvious in view of these additional references. The other unobviousness grounds argued above for the independent claims are further applicable to narrower, dependent claims 19, 20 and 22.

Reconsideration and allowance respectfully are requested.

Respectfully submitted,

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